Several of the calyces were the seat of abscesses containing phosphatic substance. The capsule separated readily. Of the right kidney, almost the whole of the renal tissue was destroyed, only a little of the pyramids was left and a thin layer of the cortex, in which were several small cysts. The interior of the sac thus formed was occupied by a yellowish, putty-like substance as of old pyo-nephrosis dried up. There was no calculus in it. All the other organs were quite normal.

ON THE USE AND THE ABUSE OF PASSIVE MOTION.[1]

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I AM induced to bring bring before the Society for discussion the well-worn but important subject of passive motion, in the hope of putting it, if possible, on a broader and more scientific basis. So many claims are made in its favor, which seem to me to be unfounded, that I think it desirable to state just what amount of good may be expected from it, and in what class of cases the method is unsuitable. I approach the subject with some hesitation, because I am apprehensive that my opinions will encounter opposition. I shall present, however, little more than the results of my own experience; and I entertain some views which I should be glad to alter, provided I could find other ones supported by credible testimony.

The phrase passive motion may appear to be somewhat ambiguous, as the word passive implies merely that the patient either offers no resistance to manipulation, or that the resistance offered to manipulation is overcome. On the other hand, the movements made by the surgeon are always active, and sometimes very forcible. A degree of severity, therefore, may belong to the procedure, which the term is not adapted to convey.

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[1] Read before the New York Surgical Society, Dec. 27, 1886.

Concerning the common form of injury known as a sprain, which most often occurs at the ankle, it may be remarked that various lesions are doubtless included under this designation. In slight cases the ligaments are, perhaps, only severely stretched; in bad ones they may be more or less completely torn. Subcutaneous extravasation of blood is usual, and occasionally hæmorrhage takes place into the adjacent joints and tendinous sheaths. In a few cases the parts continue weak and painful for a considerable, or, it may be, an indefinite period; while in a still smaller number the foundation is laid of serious organic disease.

In no form of injury do wider diversities of opinion exist regarding treatment than in that called sprain. The old-fashioned treatment, which prescribes rest and fixation of the sprained joint, is preferred by some; while wonderfully good results are declared by others to proceed from the early employment of massage, combined with passive motion, and the almost immediate use of the injured parts. As in many other instances, the truth here probably lies between the extremes. My own practice has generally been conservative. Unless the injury is of trifling degree, rest and immobility would seem to be instinctively, if not imperatively, demanded. By rest and immobility an opportunity is afforded for a reunion of the ruptured parts, while the pressure of a bandage favors the diffusion and absorption of blood, serum, and other extravasated fluids. When it may be reasonably presumed that the injury has been repaired, usually after the lapse of from one week to two weeks, passive motion has seemed to me useful by preventing or removing stiffness or pain. Aside from tuberculous disease of the joint, which may undoubtedly arise in consequence of this form of injury, I have often known the use of a badly sprained ankle to be followed by a long-continued lameness and pain. I am, therefore, inclined to be cautious, and to enjoin rest for perhaps an unnecessary period, rather than to recommend motion which might be premature. Massage and passive motion I have found most serviceable in recent sprains of mild degree, and in cases of stiffness resulting from old adhesions or prolonged disuse. In such instances I have witnessed excellent effects from these remedies, but I am disposed to look with distrust upon active treatment applied to recent strains at all severe. I have been reminded by Dr. Wm. G. LeBoutillier, lately my house surgeon in the Roosevelt Hospital, that a favorite method there, when the sprain is not severe, consists in the immersion of the injured foot for several hours in hot water, and the subsequent application of a firm bandage. Under this treatment many patients are enabled to leave the hospital, walking tolerably well, at the end of three days.

After the reduction of dislocations I have rarely found it necessary to employ passive motion. I have usually kept the injured parts quiet by means of a sling or a bandage for a period varying from a week to a fortnight, and have then encouraged the patient to resume the normal movements. In a few instances, after reducing dislocations of the shoulder, I have been obliged to use considerable force in order to break up adhesions which had formed outside the articulation, in consequence of inflammation caused by the primary injury.

Experienced surgeons are divided in opinion regarding what mode of treating fractures is least likely to be followed by stiffness. Verneuil maintains that immobilization never induces ankylosis, but tends to prevent it by averting inflammation. Other surgeons are so apprehensive of causing, by immobilization, a loss of movement, that they renounce almost entirely the use of splints, and practice passive motion very early. Both parties claim that they have obtained good results; and, without pretending to be dogmatic, I desire to state my own views as founded on personal observation.

In the first place, cases of true ankylosis must be extremely rare. The only examples of the kind I can recall are those in which comminution had taken place of the bones composing the ankle- or the elbow-joint, which had become fused during the process of repair. Provided a fracture is simple, comminution, however extensive, is not very likely to be followed by ankylosis; and, at the present day, with suitable antiseptic treatment, such a result should be infrequent, even when joint fractures are compound.

But, if true ankylosis after fracture is rare, stiffness from false ankylosis is less uncommon, and, if incurable, may greatly diminish the usefulness of a limb. Its nature and causes are various. Undoubtedly it may occur in joints from simple disuse. I remember an example of the kind which I met with many years since, while I was serving an apprenticeship in the Bellevue Hospital. A woman broke her left femur at about its middle three times in the course of eight months. During the whole of this period she was kept in bed, with the limb maintained in a straight position by means of a weight attached to the foot. Meanwhile the knee, which was remote from the seat of fracture, became so rigid that, even with the aid of an anæsthetic, only the slightest motion was possible. She was dismissed with a stiff joint.

That organic changes occur in such cases cannot be questioned. Shortening and rigidity of the capsule have been conjectured to exist, while distinct pathological conditions have been described by Bonnet[1] and Tesser,[2] who found, on post-mortem examination, or on inspecting limbs which had been removed by amputation, effusion of blood within the affected joint, undue redness of the synovial membrane, newly formed connective tissue uniting opposed articular surfaces, and swelling, erosion, and adhesion of the articular cartilages. Moreover Menzel[3] has shown by experiment that in animals, swellings, hyperæmia, and pterygium-like affections of the synovial membrane, and degenerative changes in the articular cartilages often take place in consequence of the enforced rest of a joint. Examples of the kind referred to may have been met with by every surgeon present, but they are seldom grave enough to cause serious apprehension. Furthermore, they are rare. As a rule, I have not observed that long-continued immobilization of a healthy joint gives rise to any stiffness which cannot be quickly overcome, either by passive motion or by the unaided efforts of the patient. The early restoration of the natural movements, and the absence of sharp inflammatory reaction when those are resumed, prove that no important lesions

“Gazette médicale de Paris,” 1841, pp. 609 and 625.

[1] “Traité des maladeis des articulations.” A. Bonnet, Paris, 1855.

[3] “Archiv für Chirurgie.” Bd. xii. 990.

have occurred. Nevertheless, the occasional sequel of obstinate stiffness suggests the propriety of watchful examination, and the avoidance, by timely passive motion, whenever necessary, of the injurious consequences that might otherwise ensue.

False ankylosis after fractures is usually dreaded when the fracture complicates a joint, or when it is situated very near to one. But I am satisfied that the danger in such cases has been greatly exaggerated, and that the stiffness, when it occurs, is often erroneously ascribed to the presence of morbid adhesions. In many examples of fracture at the elbow or at the ankle the subsequent limitation of motion can be traced to some bony displacement which happened at the time of the injury, and which was not accurately reduced. Or, as we have all noticed, the displacement may recur even after reduction has been accurately effected. Again, in some instances, a bony callus may impede motion by projecting into the interior of a joint. Impediments of the kind referred to are often discovered only at a late period,after the swelling of the soft parts has subsided. The ankylosis in the two first-mentioned sets of cases does not depend on the formation of adhesions, but on a faulty position of one or more of the bony fragments. It cannot be attributed to the long-continued wearing of splints, except so far as they may hide from view the existence of the impediment, and lead the surgeon to believe that things are right, whereas they are wrong. Whenever any such uncertainty is met with, therefore, I am in the habit of frequently examining the injured parts, and of resorting, if necessary, to such manual force as will restore the fragments to their proper position. Here passive motion will often be expedient, both as a test and a remedy; but it is not practiced with the intention of rupturing abnormal adhesions. At a later period, when consolidation has taken place, and motion is prevented by bony prominences, the ankylosis must be overcome, if at all, by some form of cutting operation. Passive motion, although often tried in these circumstances, would be obviously improper.

Adhesive inflammation, mainly periarticular, I believe to be the chief agent in producing the stiffness due to false ankylosis following fractures. Fortunately, this affection rarely occurs to any troublesome extent when fractures are judiciously managed, and the broken bones are held in position by splints which do not exercise undue pressure. Accordingly, much stiffness of a joint seldom follows the usual treatment of fracture, which involves keeping the parts immobilized for three or four weeks.

Even after the patella has been fractured, and the knee has been confined in a straight position for a period of eight weeks, the joint is sometimes supple almost immediately after the splints are removed; and, without artificial assistance, will allow full flexion after the lapse of several months. Believing that adhesive inflammation is rarely severe after fractures in the neighborhood of joints, or extending into them, I have not feared the occurence of ankylosis, but have generally avoided making movements before the consolidation of the fracture. So far as my experince goes, I have never had occasion to regret having followed this practice, and have never known ankylosis to result from it. Early motion, in my opinion, is very apt to be premature, and to cause the very stiffness it is intended to prevent. The case is different, however, when inflammation, denoted by pain, swelling and œdema, has actually set in. It may be argued that, at this period, the plastic material is soft, and that, by passive motion, the formation of adhesions, and the consequent stiffness, may be avoided. But even here my practice has nearly always been mild and conservative. By removing pressure, by keeping the injured parts at rest, and by making cold external applications, I have sought to control the existing inflammation and to limit the amount of fibrinous exudation. To anticipate one evil effect of ankylosis, however, I have in these cases been careful to place the joint, if possible, in such a position as would render the limb more serviceable in the event of subsequent stiffness. Passive motion I have seldom practiced under these conditions, because it has appeared to me that it might do harm. Indeed, while the parts are swollen and tender, motion is difficult and painful, and if perseveringly made, is liable, according to my experience, to cause an aggravation of all the unpleasant symptoms. On this point, however, I desire to speak with some reserve, because I have very little actual knowledge concerning the effect of passive motion practiced under the circumstances described. I have found it to be extremely painful, and I have suspected it to be mischievous. This is all I am willing to say. After operations for correction of the deformity caused by Dupuytren's contraction of the fingers, and after plastic operations on the hand, I have usually resorted to passive motion within a week, and have thought the stiffness was thereby prevented. Now a similar rule may apply to fractures when threatened with ankylosis; but I have had no experience which wonld convince me that such is the fact.

In common with many other surgeons, probably, I have met with stiffness most often after fractures of the lower end of the radius. I have seldom seen it except in persons who had passed the middle period of life, and I have never known it not to be preceded by signs of inflammation, which I believed to be adhesive in character, and to involve especially the sheaths of the tendons in the neighborhood of the wrist. Certainly, the stiffness which occasionally follows is due rather to adhesion of the tendons than to any affection of the joints. The liability to this unfortunate occurrence has led some eminent surgeons to discard altogether the use of splints in the treatment of these fractures, and to seek to prevent stiffness by an early resort to massage and to active and passive motion. I am not prepared to condemn such treatment entirely, or to deny that it may sometimes be expedient. But I am unwilling to believe that it is usually either necessary or safe. Some of the worst results I have witnessed have followed a neglect to fulfil the ordinary indications to reduce the displacement, and to maintain the reduction by the application of suitable splints. Not only deformity, but also loss of motion, may follow such neglect; and I am sure that a proper reduction of the fragments will go far toward preventing the occurrence of inflammation, on which the stiffness ultimately depends. It can be conclusively shown that immobilization of the injured part may be usually enforced for a long time without giving rise to ankylosis. At the Roosevelt Hospital, where many fractures of the lower end of the radius are treated, the plan adopted is to reduce the displacement at once as far as possible, and to apply two straight wooden splints, which extend along the forearm and the hand, but not so far as to impede the movements of the fingers. These splints are occasionally removed for the purpose of examining the parts, which are otherwise allowed to remain undisturbed for a period of four weeks. The splints are then dispensed with, when the bones are found to be firmly united, the freedom of motion being only slightly impaired. The results thus obtained are excellent, and the normal movements are soon regained.[1] Two hundred and twenty-seven cases have been treated according to this method during the past three years, and only one case has terminated in permanent stiffness.[2] It may be fairly maintained, therefore, that, as a rule, these fractures can be successfully treated without resorting to early passive motion. Moreover, the fact that such fractures commonly get well without stiffness, when the surgeon early begins passive motion proves nothing in favor of it, because they might have recovered equally soon if this had been omitted. But we must admit that stiffness now and then occurs; and the problem to be solved is how this can be obviated. I frankly confess that I am unable to offer, under all circumstances, a sure remedy. When the patient is old and rheumatic, the injury severe, and the inflammation active, I believed that stiffness may follow, whatever plan of treatment is pursued. I should be careful in such a case to remove all pressure of splints which might increase the existing inflammation, and to combat the latter by rest, elevation of the limb, and by making cold applications to the tender and swollen parts. Passive motion I should defer until the acute stage had subsided. An early resort to the latter method while active inflammation is in progress, I have never dared to prescribe, fearing that it might cause harm. If I could be convinced from the experience of my colleagues that such a practice was beneficial, instead of injurious, I should be glad to change my present opinion, and to renounce the plan of treatment which I have found generally, if not uniformly, successful.

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[1] I am indebted for these statistics to Dr. Geo. S. Huntington.

[2] The patient referred to was a man who was treated in the usual manner, after the accident. He remained away from the hospital, contrary to instructions, for a period of three weeks; when he returned, his wrist was found to be stiff. No further particulars are contained in the records.

I can speak much more positively and favorably respecting the efficacy of passive motion in promoting convalescence after fractures, by removing what are called their residua—namely, swelling, stiffness, and pain in attempting movement. Often, it is true, these symptoms are not very marked, and will disappear entirely if the patient is encouraged to use the limb. But when they are decided and persistent, and when the natural movements are shunned on account of pain, indolence, or timidity, the value of massage and passive motion is unquestionable. When practiced daily, or every second day. such treatment will frequently cause rapid improvement, by rendering the circulation in swollen parts more active, by dissipating the swelling, which is usually due to passive œdema, and by making motion easy and painless, As every surgeon knows, patients who have suffered from fractured limbs are often reluctant to use them, even after the bones are firmly united; and it is in this class of cases that friction and passive motion are so valuable. Not infrequently, indeed, physicians, as well as patients, are deceived by the idea that the symptoms are indicative of inflammation which requires rest; and for this reason patients are sometimes disabled for a long period, and possibly treated for rheumatism or for some other disease which does not exist. A few active manipulations will reveal the error in diagnosis, and not seldom accomplish a cure. The sudden disappearance of pain on motion which is occasionally noticed in these cases, can hardly be otherwise explained than by supposing that abnormal bands or adhesions have been forcibly ruptured. Whatever be the rationale of the treatment referred to, there can be no doubt that it is eminently successful.

In a small number of cases of stiff joints following injury, or dependent upon long-continued fixation of a limb, I have derived great advantage from the employment of an anæsthetic. The absence of pain and of muscular contraction thereby induced, facilitates the necessary movements, and occasionally affords valuable aid in diagnosis. As a rule however, anæsthetics may be dispensed with, and, furthermore, repeated movements are commonly needed to obtain the desired result.

I possess no personal knowledge of cases of slipping or adhesion of tendons, or of mysterious or unexplained lesions which, having resisted the ordinary means of treatment, have been brought to speedy recovery by the rough handling of bone-setters, and I believe that most of the statements made regarding their achievements are, to use a mild term, inaccurate. I am incredulous and suspicious of all marvellous cures, whether claimed to have been wrought by bone-setters, or by orthodox members of the medical profession.

I have met with little or no success when applying passive motion for the purpose of overcoming the firm contraction of the skin and deeper tissues which follow burns and other injuries accompanied with much loss of substance. The limit of stretching of which scars are capable by passive motion is soon reached, and further attempts to extend them are quite liable to cause rupture.

The value of passive motion as a means of overcoming ankylosis due to disease not caused directly by injury, is a subject which admits, perhaps, of but little discussion. But there are some facts relating to it which should be distinctly stated, and there are some errors prevalent, which should, I think, be corrected. Among the severer affections of the kind referred to, I have found most amenable to treatment cases of stiffness of the shoulder, apparently unconnected with disease of the joint, but dependent upon the pressure of adhesions in the large bursa situated beneath the deltoid muscle. This disease, which has been well described by Duplay, has many features resembling those due to arthritis, from which, however, it is not hard to distinguish. But the movements of the arm at the shoulder-joint may be limited and painful, and the usefulness of the limb nearly lost. I have encountered many such cases, and have invariably succeeded in affording relief by the employment of passive motion. This I have always practiced after administering an anæsthetic, and I have sometimes been compelled to resort to considerable force in order to overcome the resistance. The adhesions, wherever situated, usually give way with an audible sound, and the freedom and extent of motion are completely, but sometimes only temporarily, restored. By the subsequent use of passive and of voluntary motion, and by repeating the manipulations while the patient is under ether, if necessary, I have seldom failed to obtain a complete and permanent cure.

Unfortunately, I am unable to record equally good results from the treatment by passive motion of any other form of ankylosis, if I except certain cases of hysterical muscular contraction, which may be dismissed with this bare allusion. Most often I have had occasion to employ passive motion with the simple, but important object of putting the diseased limb in a suitable position. Even before such an attempt is made, however, discrimination and caution are sometimes necessary. Probably most surgeons would agree that, when true bony ankylosis exists, passive motion should not be made to correct the deformity, which should be dealt with, when necessary, by the use of the knife and the saw. Passive motion may also fail to alter the position which a limb has assumed in the course of tuberculous arthritis of long standing. When, in old hip-disease, the thigh has become much flexed and adducted, forcible motion, intended to secure a straight position, is at least a doubtful expedient. It will probably turn out to be unsuccessful, because the soft parts will be found so contractured and rigid that nothing short of actual violence will cause them to yield enough to permit a correction of the deformity, which, moreover, may be further maintained by bony alterations impossible to anticipate or overcome. Again, the employment of much force, in such circumstances has often been known to set up severe inflammation, with even fatal consequences. Excision, therefore, although apparently a harsher remedy, would seem to be preferable, as involving less danger, and obtaining a better and more definite result. Similar remarks may be made respecting the knee. When, in consequence of old joint disease, the leg has become flexed and rotated outward, the head of the tibia partly dislocated backward, and the soft parts behind the joint contractured, any attempt to straighten the limb by passive motion, even when preceded by tenotomy of the hamstrings, will be futile, and the end in view can be gained only after a formal excision has been performed. But, in the early stage of arthritis, whether tubercular, gonorrhœal, rheumatic, or of other origin, a bad position can always be safely corrected by manual force, aided by an anæsthetic, when necessary, and thereby, in the event of ankylosis, one of its most disastrous consequences can be prevented.

For the purpose of restoring movements which have been impaired or lost from the occurrence of firm false ankylosis of the joint from whatever cause, or for the removal of stiffness dependent on the firm adhesion of tendons to their synovial sheaths, my results, after many trials of passive motion, have been so discouraging that I now seldom advise this mode of treatment as a means of cure. As, however, the exact amount of resistance to be overcome, and the exact pathological condition cannot be settled beforehand, I almost invariably, when consulted in cases of the kind referred to, advise the administration of ether, and the trial of a fair amount of forcible manipulation. But, if the adhesions are numerous and firm, and great force is required to re-establish mobility, I have found that even when the movements become very free and extensive at the time of operation, they are lost again almost immediately afterward, the stiffness returning, and being as bad as before. It is often said that, in these cases, failure is due to a neglect, on the part of the surgeon, to maintain the advantage already gained by the continued practice of passive motion. But I am convinced that this assertion is untrue. So much pain, swelling, ecchymosis follow the first attempts to move the stiffened parts, that for a day or two afterward they must be allowed to rest; and when inflammation has abated sufficiently to warrant a repetition of passive motion, the whole thing has to be done over again, and with the same result. My experience with this method in such cases has been so uniform, that I cannot doubt the correctness of the opinion I have expressed. I recall an instance in which a man, who once consulted me, was treated in the manner I have described; and, although, at the time of the operation, the leg, which was at first extended, could be well flexed, the stiffness soon returned, and was as marked as ever. I kept the man's leg extended during his convalescence, and then advised him to let it alone. But he fell into the hands of an enterprising and enthusiastic surgeon, who promised to cure him, and who afterward boasted than he had done so. I finally caused an inquiry to be made about the patient, and ascertained that the joint had soon become again immovable.

To sum up what I have said, I am not an advocate of passive motion, except under the restrictions which I have endeavored to define. I believe that when practised without discrimination, it will often be unsuccessful, and sometimes injurious, by inducing or increasing inflammation. I am certain that the severer forms of ankylosis and of fixation of tendons are frequently due to this disease, and that the inflammation will be aggravated by employing passive motion before the active symptoms have disappeared. The idea that motion will always prevent ankylosis is a fallacy which is contradicted by common experience. I have performed the operation of excision of the elbow for the cure of true ankylosis, and I have seen such operations performed by others, during which, perhaps, too little bone was taken away; and, in spite of the early and diligent use of passive motion, the stiffness has returned, bony consolidation has recurred, and the operation of excision has had to be repeated. But motion may even be successfully employed as a means of causing a bony deposit to take place. It is a well-known fact that, in many instances of ununited fractures of the thigh or of the leg, bony union may be determined by the inflammation which is set up by making forcible motion of the fragments, or by causing the patient to walk about upon the injured limb, with the view of pressing them against each other. On the other hand, by operating according to modern antiseptic methods, which tend to prevent inflammation, partial excisions of even so intricate a joint as the elbow may sometimes be performed without any impairment of its mobility.

I have brought the subject of passive motion to the attention of the Society, because it is one of great practical importance, about which surgeons are frequently consulted, and about which there may be honest differences of opinion. What I have stated here is the result of my own experience; but, as I mentioned in the beginning, I should be glad to change some of my present views, if others could be advanced which were sustained by evidence that appeared to me to be clear and trustworthy.

PLASTIC OPERATION FOR CLOSURE OF A LARGE LARYNGEAL FISTULA.[1]

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IN December, 1885, a man æt. forty-five years, presented himself for treatment of an opening in the side of his larynx immediately above the vocal cords, into which the end of one's thumb could be thrust. In the month of April preceding, he had tripped while rising from his cobbler's bench with a shoemaker's knife in his hand, and had so stumbled that he fell upon the point of his knife, which was thrust well into the thyroid cartilage of the left side. It was an ugly gash and bled severely. He was carefully treated in the Bridgeport hospital at once, a tracheal tube was inserted and, he says, was worn a month. The hole in the cartilage was just above the vocal cord attachment, and laryngeal inflammation probably followed and impaired his breathing. After another month an operation was performed to close the fistula by suturing, but was ineffectual.

He then came to New York and was subjected to five more attempts at closure by his physician at home. The methods varied: Sometimes silver wire sutures were used, after paring the edges; sometimes, silk. Twice were the harelip pins and figure-of-eight suture used. But after each operation mucus and discharges burst the wound open and left him more desperate than before. The successive parings of skin and cartilages had resulted, with what ulceration occurred be-

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[1] Reported to the New York Surgical Society, Dec. 22, 1886.